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A RESTORATION OF
THE MAUSOLEUM AT
HALICARNASSUS

J. J. STEVENSON

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~~Francis L. Mathews~~

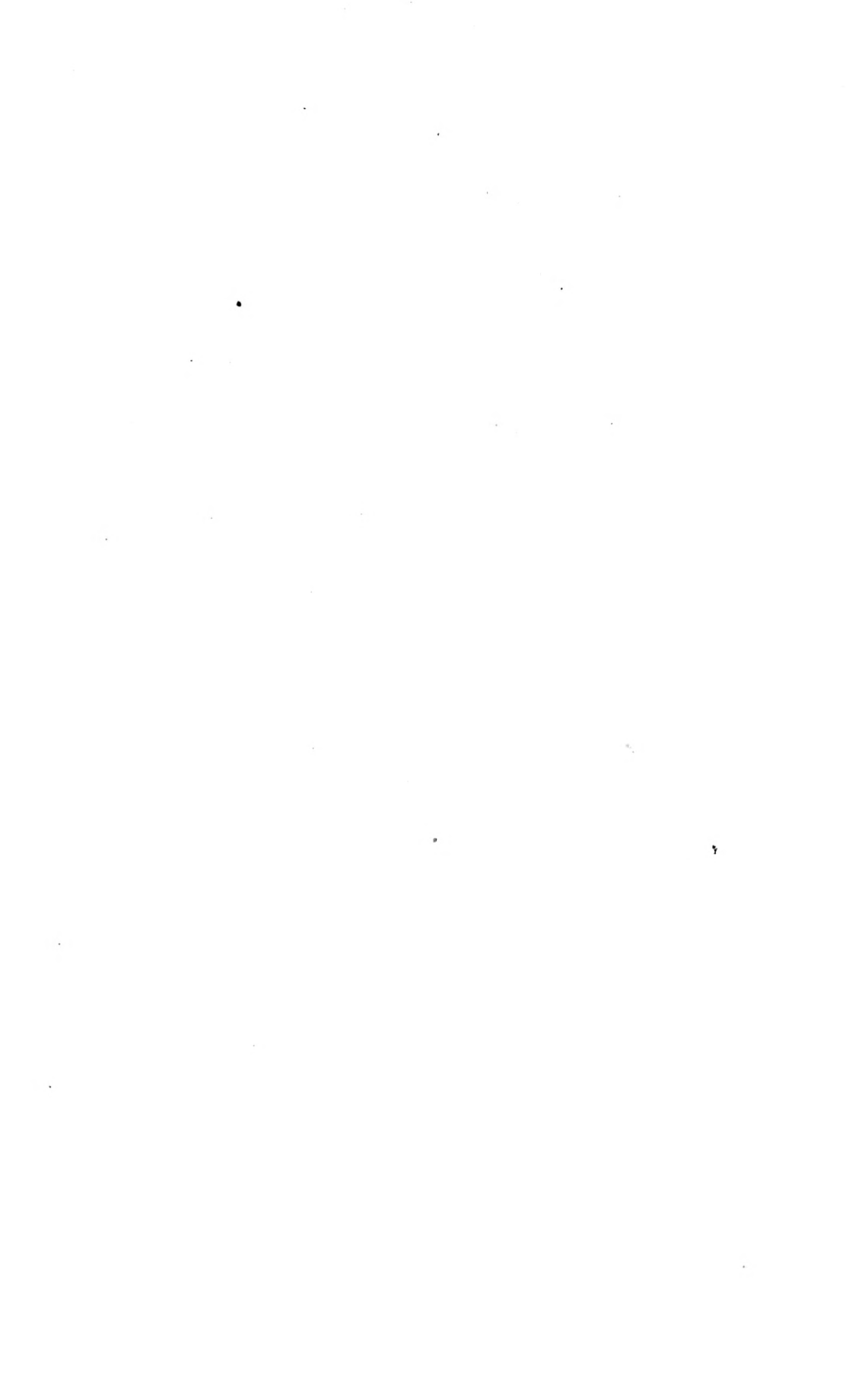
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BY

J. J. STEVENSON, F.S.A.

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THIS paper was originally read before the Society of Antiquaries of London on May 7th, 1896, and was published in *The Builder* of August 27th of the same year. To meet some of the criticisms it received, Mr. Stevenson subsequently amended his design in certain details. He had determined to republish the paper, and though at his death in May 1908 the manuscript still awaited final revision, it is now issued in the hope that it may prove of interest.

The frontispiece, from a water-colour drawing made by Mr. E. J. Lambert under Mr. Stevenson's direction, is reproduced by permission of the Trustees of the British Museum, to whom the drawing has been presented.

A RESTORATION OF THE MAUSOLEUM AT HALICARNASSUS

PLINY's description of the Mausoleum at Halicarnassus—the tomb which Artemisia his wife (and sister) built for Mausolus, King of Caria—has been to architects and archæologists what the discovery of the North Pole has been to sailors and geographers—a problem which successive generations have tried to solve.¹

Sir Christopher Wren tried his hand by reproducing the building from Pliny's description and other notices of it which existed. For every trace of it had disappeared—overthrown, no doubt, by an earthquake, the remains serving for centuries as a quarry. His son, in the 'Parentalia,' gives a description of the design, but adds, 'The plate of the above is omitted on account of the drawing being unfinished.' WREN'S
RESTORATION

'The sepulchre of Mausolus,' Wren says, 'is so well described by Pliny² that I have attempted to design it accordingly, and also very open, conformable to the description in Martial:—

"Aëre vacuo pendentia mausolea,"

and yet not wanting the solidity of the Doric order. The architects living before the time of Alexander, which was

¹ A list of restorations is given in the official handbook to 'The Mausoleum and Sculptures of Halicarnassus and Priene,' in the British Museum, by A. H. Smith, M.A., 1900.

² Pliny's description will be found on pp. 11, 12.

before the Ionic order was first in use, I conclude this work must be the exactest form of the Doric.'

Wren bases his design on the proportions of the Doric order. The lowest part consists of columns, with statues seven feet high on the cornice; on the sixteen inner columns rose the pteron, consisting of a pedestal twenty feet high, pilasters of twenty-four feet with a cornice of six feet, and a stone covering of twenty-four feet, the steps being twelve inches high and six inches 'saile.' 'I have omitted,' he says, 'the triglyphs in the frieze, which I take to be the only place for the inscription, and monuments never were without.' . . .

'There might be round upon the first order twenty statues, sixteen more below upon the solids in niches, and twelve in niches of the pteron, in all forty-eight, each statuary taking twelve.'

HAWKSMOOR'S
RESTORATION

Hawksmoor, Wren's pupil, in his church of St. George, Bloomsbury, built about 1750, reproduced what he thought was the pyramid of the Mausoleum, in its steeple rising in steep steps, supporting on its apex George II. as St. George instead of the chariot of Mausolus.¹

The height to the top of the statue is one hundred and forty-six feet, which, if he took a larger foot than ours, like the Roman foot, might represent Pliny's one hundred and forty feet for the height; and it has twenty-four steps, as Pliny says the Mausoleum had, but of various heights. The statue is fairly seen, even in the atmosphere of Bloomsbury; in the pure air of Caria every detail of the quadriga which crowned it would be clearly visible.

¹ Street had this church to restore; he removed the galleries inside as inconsistent with what a Christian church should be, though they were an essential part of the architecture, and substituted some ugly draperies at the corner of the steeple below the statue for some quaint sculptures, including the Lion and Unicorn.

THE MAUSOLEUM AT HALICARNASSUS 7

Professor Cockerell designed a restoration in which the thirty-six columns were arranged two deep around a central cella. After the discovery of the remains he modified it in some respects, but not sufficiently to make them part of his design. It is beautiful and interesting, the work of one who, like no other, knew Greek Architecture, practical and stable ; but the remains of the building which we possess prove it impossible. The roof is a steep pyramid like some roofs of tombs represented on ancient coins, but we know from the remains its pitch was low ; it is higher than Pliny's measurements allow, though it has only twenty steps instead of twenty-four. His angle columns are square, not circular, as we know they were from a corner capital we have. It has an attic above the order for which Pliny gives no authority, and it hardly professes to embody his measurements. For this and other reasons, however excellent as a design, it cannot be accepted as a restoration of the Mausoleum.

COCKERELL'S
RESTORATION

Cockerell's design, as regards the arrangement of the thirty-six columns, which Pliny says surrounded the building, was adopted and modified by Watkiss Lloyd (*Archaeologische Zeitung*, iii. 81), and by Edward Falkner, in 1851 (*Museum of Classical Antiquities*, i. 157). In their design, as in Professor Cockerell's, the columns forming the pteron are arranged in two rows round a small central cella, measuring twenty-two feet outside and fourteen feet inside, which supports the quadriga.

LLOYD AND
FALKNER'S
RESTORATION

In the year 1857 Sir Charles Newton obtained permission from the Sultan to search for and remove the remains of the Mausoleum. A small warship was lent him for the purpose, and these remains are now in the Mausoleum Room at the British Museum.

PULLAN AND
NEWTON'S
RESTORATION

In his account of the discovery he adopted as its

probable restoration a design suggested first by Lieutenant Smith, and carried out by Mr. Pullan, who accompanied the expedition as engineer and architect respectively.

The 'motive' of this design is the size of the steps of the pyramidal roof. These are so flat and low that it requires a much larger building for twenty-four of them (the number Pliny says there were) to cover than Cockerell, taking Pliny's dimensions for the size of the building, had supposed.

To get in these twenty-four steps the base from which they rise must be widened; so Pullan and Newton make the central chamber the 'pteron,' putting the thirty-six columns in a single row outside it. They take Pliny's statement that the entire circuit of the building was four hundred and eleven feet for the base of the pteron, with a solid central chamber of the size Pliny says—sixty-three feet on the sides and shorter on the fronts—and to get his total height of one hundred and forty feet mount it on a solid basement about sixty-five feet high. Such a structure has certainly not Martial's characteristics of airy openness, 'hanging in empty air.'

FERGUSSON'S RESTORATION

Fergusson, to whom all students of architecture are indebted for the important service he has rendered in his *History of Architecture*, rejecting Newton's restoration, makes one of his own in an essay published in 1862—'The Mausoleum at Halicarnassus restored in conformity with the recently discovered remains.' He discusses the written authorities and the remains in the Museum, and gives plates of a suggested restoration founded on a scheme of ratios. It was inevitable that Mr. Fergusson should try his hand at it, and perhaps it was also inevitable that he should advise how, in one respect, the architects might have made it better than we know from the remains

in the Museum that they did. 'As I first restored the building,' he says, 'I placed a square anta in the angles with pilasters on each face, as are found in the angles of the Erechtheum at Athens. I had overlooked the fact that a capital was found with an angular volute, which settles the question, but I still think that, architecturally, the square pier arrangement would have been the best.'

'After trying several others,' he says, 'the solution appears to me to lie with the hypothesis that the angle columns were coupled, or, in other words, half an intercolumniation (five feet three inches) apart from centre to centre.'

'Should it be asked if there are any other examples of this arrangement the answer must probably be that there are not, but there is also no other building which from its design would so much require strengthening at the angles.' Fergusson's design is on the same lines as Smith's and Pullan's, with the thirty-six columns in a single row, a column in the centre of each front, contrary to Greek practice, but the lower story open, divided by square columns, instead of a solid wall; and for the meta a low pedestal on which the quadriga rests, as in Newton's restoration of the Lion tomb at Cnidos.

It is an original design of his own, and it has somehow a singularly modern look, suggesting a Town Hall with the municipal offices on the ground-floor, rather than a tomb. It does not carry conviction, and has not, I think, been accepted as the solution of the problem.

The late Mr. Edmund Oldfield contributed to the OLDFIELD'S Society of Antiquaries a restoration of the Mausoleum in RESTORATION their papers on June 15th and 22nd, 1893, and June 21st, 1894, which are printed with illustrations in the fourth volume of the second series of *Archæologia*.

In these he has collected all the accounts of the Mausoleum and the reference to it in old writers, discussing the various readings and emendations of the texts, and he gives drawings and descriptions of previous restorations and of other ancient tombs which may have resembled the Mausoleum and may give hints for its restoration.

He founds one main part of his restoration on a word in Pliny's description, where, after mentioning the four sculptors of the frieze, Pliny continues:—*'Accessit et quintus artifex'*—there came in also a fifth artist—*'namque supra pteron pyramis altitudine inferiorem aequavit viginti quatuor gradibus in metae cacumen se contrahens,'* which he translates, 'For above the pteron a pyramid equalled the lower pyramid in height,' not *'aequat,'* he observes, 'in the present tense, like the rest of the sentence, but "*aequavit*" in the praeterite.' That means, he says, this fifth artist 'found the roof a complete pyramid of twenty-four steps, pointed like a meta; but he wished to crown it with a quadriga, and this could not be placed on a meta's point. He therefore, as I believe, truncated the pyramid sufficiently to make a platform for his quadriga. Henceforth the pyramid no longer equalled in height the pyramid in the lower part of the building, and no longer had twenty-four steps; but on the new or truncated summit or platform thus obtained, he placed the quadriga, which was still standing in Pliny's day, and which is therefore mentioned by him in the present tense, "*In summa est quadriga marmorea quam fecit Pythis,*" bringing the total height of the monument to one hundred and forty feet.'

He follows Newton in taking Pliny's circuit of four hundred and eleven feet as the size of the pteron, arranging the thirty-six columns in a single row, ten on each side, counting each angle column twice. This would make all the sides equal, so, to distinguish the fronts and make

them shorter than the sides, he advances six columns supporting a pediment on two opposite sides, and thus gets an opening, not a column in the centre. The arrangement is most ingenious, and makes a not unpleasing building.

But later editors prefer 'aequat' in the present tense, which cuts away any authority for the very unlikely alteration in the building after the pyramid had been completed either during the two years Artemisia lived after her husband's death, or after she died, when, Pliny tells us, there was no one to pay for it. And we may take it that the quadriga, its crowning feature, was an essential feature of the design from the first. Its support must have been prepared for from the foundations.

On another word in the same passage Mr. Oldfield rests another part of his design, taking it to mean that besides this pyramid truncated for the quadriga 'pyramis altitudine aequavit inferiorem,'—a pyramid equalled the lower pyramid in height—which in his design he makes a base of twelve steep steps to the building. That cannot accurately be called a pyramid, and would be an unusual feature in a Greek building. But Newton and other editors prefer *altitudinem*, as in some manuscripts, which would mean that the pyramid, contracting itself to a meta above the Pteron, equalled the height below it.

The data which we have for a restoration of the Mausoleum are, first, the descriptions and dimensions WRITTEN RECORDS given by old writers—Pliny, Hyginus, and Martial, and the story of its destruction by De la Tourette and the Knights of Rhodes to build the castle of Budrum.

Pliny's statement in his *Natural History*, Book xxxvi., c. 5, written about A.D. 50, is as follows:—

'Scopas habuit aemulos eadem aetate Bryaxin et

Timotheum et Leucharem de quibus simul dicendum est, quoniam pariter caelavere Mausoleum. Sepulchrum hoc est ab uxore Artemisia factum Mausolo Cariae regulo, qui obiit Olympiadis centesimae sextae anno secundo. Opus id ut esset inter septem miracula ii maxime artifices fecere. Patet ab Austro et Septentrione sexagenos ternos pedes, brevius a frontibus, toto circuitu pedes ccccxī.; attollitur in altitudinem viginti quinque cubitus; cingitur columnis triginta sex. Pteron vocavere. Ab Oriente caelavit Scopas, a Septentrione Bryaxis, a Meridie Timotheus, ab Occasu Leochares; priusque quam peragerint, regina obiit. Non tamen recesserunt nisi absoluto, jam id gloriae ipsorum artisque monumentum judicantes; hodieque certant manus. Accessit et quintus artifex. Namque supra pteron pyramis altitudine inferiorem aequavit, viginti quatuor gradibus in metae cacumen se contrahens. In summa est quadriga marmorea quam fecit Pythis. Haec adjecta centum quadraginta pedum altitudine totum opus includit.'

Mr. Oldfield translates this as follows :—

'Scopas had as rivals in the same age Bryaxis and Timotheus and Leochares of whom it is right to speak together, since they equally adorned with sculpture the Mausoleum. This is the sepulchre made by his wife Artemisia for Mausolus, ruler of Caria, who died in the second year of the hundred and sixth Olympiad. That that work should rank among the seven wonders (*i.e.* of the world) those artists mainly brought about. It extends on the south and north to sixty-three feet, to a shorter space on the fronts in its entire circuit to four hundred and eleven feet; it rises to its height by twenty-five cubits; it is surrounded by thirty-six columns. They called it the pteron. On the east Scopas sculptured it, on the north

Bryaxis, on the south Timotheus, on the west Leochares; and before they had completed it the Queen died. They did not, however, withdraw, unless when it was quite finished, judging it to be a monument to the glory of themselves and of Art; and to this day their hands appear in competition. There came in also a fifth artist. For above the pteron a pyramid equalled in height the one below, contracting itself by twenty-four steps into the summit of a meta. On the top is the marble quadriga which Pythis made. This having been added includes the whole work in a height of one hundred and forty feet.'

Hyginus, a contemporary of Vitruvius, says, in a passage which Mr. Falkner claims to have found: 'Monimentum regis mausoli lapidibus lychnicis altum pedes LXXX.; circuitus pedes MCCCXL.' ('The monument of King Mausolus in polished stone eighty feet high, thirteen hundred and forty feet in circumference.')

Martial's words are as follows:—

'Aëre nec vacuo pendentia mausolea
Laudibus immodicis Cares in astra ferant.'
De Spectaculis, Epig. i.

('Nor with extravagant praise let the Carians extol to the stars Mausolea hanging in empty air.')

Guichard, in a work published at Lyons in 1581, *Funérailles et diverses manières d'ensevelir des Romains, Grecs, etc.*, gives the following story:—

'In the year 1522,' he says, 'when Sultan Solyman was preparing to attack Rhodes, the Grand Master, knowing the importance of the Castle of St. Peter, and being aware that the Turks would seize it easily at the first assault, sent some knights thither to repair the fortress and make all the preparations to resist the enemy. Among the

number of those sent was the Commander de la Tourette, a Lyonnese knight, who was afterwards present at the taking of Rhodes, and came to France, where he related what I am now about to narrate to M. D'Alechamps, a person sufficiently known by his learned writings, and whose name I mention here only for the purpose of publishing my authority for so singular a story.

'When these knights had arrived at Mesy (Budrum), they at once commenced fortifying the castle; and, looking about for stones wherewith to make lime, found no more suitable or more easily got at than certain steps of white marble, raised in the form of a terrace (*perron*) in the middle of a level field near the port which had formerly been the great *Place* of Halicarnassus. They therefore pulled down and took away these marble steps, and, finding the stone good, proceeded, after having destroyed the little masonry remaining above ground, to dig lower down, in the hope of finding more.

'In this attempt they had great success, for in a short time they perceived that the deeper they went the more the structure was enlarged at the base, supplying them not only with the stone for making lime, but also for building.

'After four or five days, having laid bare a great space one afternoon, they saw an opening as into a cellar. Taking a candle, they let themselves down through this opening, and found that it led into a fine large square apartment, ornamented all round with columns of marble, with their bases, capitals, architrave, frieze, and cornice engraved and sculptured in half-relief. The space between the columns was lined with slabs and bands of marble of different colours, ornamented with mouldings and sculptures in harmony with the rest of the work, and inserted in the white ground of the wall, where battle scenes were represented in relief.

‘Having at first admired these works, and entertained their fancy with the singularity of the sculpture, they pulled it to pieces, and broke up the whole of it, applying it to the same purpose as the rest.

‘Besides this apartment, they found afterwards a very low door, which led into another apartment serving as an antechamber, where was a sepulchre, with its vase and helmet (tymbre), of white marble, very beautiful, and of marvellous lustre. This sepulchre, for want of time, they did not open, the retreat having already sounded.

‘The day after, when they returned, they found the tomb opened, and the earth all around strewn with fragments of cloth of gold, and spangles of the same metal, which made them suppose that the pirates, who hovered along this coast, having some inkling of what had been discovered, had visited the place during the night, and had removed the lid of the sepulchre. It is supposed that they discovered in it much treasure.’

‘It was thus,’ adds this quaint old writer, ‘that this magnificent tomb, which ranked among the seven wonders of the world, after having escaped the fury of the barbarians, and having remained standing for the space of two thousand two hundred and forty-seven years, was discovered and destroyed to repair the Castle of St. Peter, by the Knights of Rhodes, who immediately after this were driven completely out of Asia by the Turks.’

But these notices could give us no certainty as to the ACTUAL form of the building without the actual remains of it (only REMAINS too few, but absolutely authentic so far as they go), which Sir Charles Newton discovered on its site.

These remains were arranged by the late Dr. A. S. Murray, the Director of Greek and Roman Antiquities in the British Museum, in the Mausoleum Room. They

include the complete order with its column, base, and capital, its architrave, frieze, and cornice—seventeen slabs of the frieze, making a length of eighty-five feet nine inches; all representing combats of Greeks and Amazons—some fragments of another frieze representing chariot races, of softer marble, and therefore probably placed where they were not exposed to the weather—one of the angle capitals—a marble beam which may fix the width between the exterior range of columns and the wall or columns inside them—some fragments of one of the lacunaria or ceilings between the columns—and most important of all for determining the general appearance and structure of the building, a number of the marble steps of the ‘pyramid contracting itself into a meta.’

Of sculpture, there are fifteen lions, all with their heads turned outwards as if to guard the sepulchre—remains of the quadriga which crowned the tomb, including the fore-quarters of one of the colossal horses, the bronze bit still in its mouth, and the hind-quarters of another—part of the wheel of the chariot, sufficient to reconstruct it; the statue of Mausolus practically complete, and of Artemisia holding the reins (her face alas! gone), which stood together in it. There are also torsos of a colossal horse and its rider in violent action; of a colossal figure seated on a throne, the arm the same as on the statue of Mausolus, and of some statues slightly over life-size.

Sir Charles Newton had brought home only the lowest and uppermost stones of a column; and from these Professor Penrose calculated its height. His wide and critical knowledge of Greek Art, shown in his great work on the Parthenon, and his mathematical ability, warrant acceptance of the result he arrived at. With the marbles of the base and capital of the columns and of the entablature with its sculptured frieze, Dr. Murray was able to recon-

struct the order, supplying the missing parts by plaster castings.

Unfortunately the room is not high enough, and I first became interested in the Mausoleum when Dr. Murray asked me how he should divide the order, whether he should set up column and entablature separately, or divide the column and put the entablature on the upper half of it. The obvious solution was to raise a part of the glass roof sufficient to let the whole order rise complete. This would have allowed the proportions of the order to be seen, and would have raised the cornice with its carving and the sculptures of the frieze up into the light where they could be seen, but the architect of the gallery objected to any alteration of his building even if the cost could have been got from the Treasury. The possession by the nation of a treasure like this implies an obligation to let it be properly seen.

The positions in which the marbles were found indicate that the Mausoleum had been overthrown by an earthquake some time in the Middle Ages. The horses of the quadriga were found buried in the bank on the north outside the enclosing wall, and had remained buried ever since, as the bronze bit remains in the mouth of one of them. The other sculptures are mere torsos, everything breakable having been broken off them to make lime, the ruined building serving as a quarry till in 1522 the Knights of Rhodes carried away what remained of it above ground, and even the foundations, of which Newton found no trace.

Till Newton's discovery of the flat steps of the pyramid all the restorers understood Pliny's words to mean that the pyramid rose from a base of sixty-three feet on the sides by something less on the fronts.

I shall attempt to show that Newton's discovery does not make it necessary to widen the base of the pyramid, as

later restorers have done, but that a restoration on the lines of a smaller base is not only possible, but accords with Pliny's description, with the dimensions which he and Hyginus give, with Martial's praise of it as hanging in empty air and raised to the stars, and with what the Knights of Rhodes saw before they destroyed it; that this also finds their right positions in the design for all the remains discovered on the site; the construction stable, such as would stand for the centuries the Mausoleum lasted till it was destroyed by violence.

The evidence for each part is not equally conclusive, some of it is necessarily conjecture; its force is cumulative, and in satisfying all the conditions may fairly be counted proof.

THE ORDER

The order as erected in the Museum is thirty-seven feet three inches high. Pliny says the height of the pteron was twenty-five cubits (or thirty-seven and a half feet). This practical identity is proof of his accuracy, and entitles us to accept his other measurements as correct. The difference would be imperceptible in a drawing or even in the building.

ARRANGEMENT OF COLUMNS

By ranging the thirty-six columns, as Cockerell does, in two rows, an outer and an inner, seven on each side, and six on each front (counting the angle columns twice), twenty-two on the outer and fourteen in the inner rows, and determining the distance between the columns by the lacunar and the marble beam, we get a building of exactly Pliny's dimensions, with a space—not a column—in the centre of the fronts, as is proper in Greek buildings.

The distance from centre to centre of the columns we find from the remains was 9 ft. $9\frac{1}{4}$ in. This multiplied by six, the number of spaces on the sides according to Cockerell's arrangement, is 58 ft. $7\frac{1}{2}$ in. Adding 3 ft.

5 in., the diameter (measured from the columns in the Museum at their base) of the two half columns at the end of the colonnade, gives for the length of the colonnade 62 ft. $0\frac{1}{2}$ in. Allowing some extra inches for the projection of the base, this approximates very closely to Pliny's statement.

This arrangement, giving seven columns at the sides, gives six at the fronts, which Pliny says were shorter, and makes their length about 53 ft.

Cockerell's arrangement of the thirty-six columns is that which every one adopted as the meaning of Pliny's words, till the discovery of the broad flat steps of the pyramidal roof led the restorers to enlarge the building to find space for the twenty-four broad steps of the pyramid.

This low flat pyramid jars on our preconceived ideas, but we must accept it as absolutely proved by the remains. I tried to believe that these flat steps might have been steps forming the base of the monument, but the ingenious care taken to prevent water getting through them proves that they must have formed a roof-covering over some part of the monument which had to be kept dry.

The edge of each stone at its junction is raised in a ridge a quarter of a circle in section, which, fitting close to the similar quarter circle on the stone next to it, forms a roll like the rolls on a flat lead roof, preventing any water from lying on the joints and getting through. And this ledge is carried round the back of each step, a hollow being made in the bottom side of the covering stone to receive it, thus preventing any water penetrating through the roof at the back of each stone. The ledges at the back, and the grooves in the stone above them to fit them, as well as the draft lines at the front, show the position in which each stone was placed on the one below it, and absolutely

determine the slope of Pliny's 'pyramid' to be that adopted in Smith's and Pullan's restoration.

PYRAMID AND
META

The corner stones in the pyramid, of which there are four in the Museum, prove that its contiguous sides rose at different angles; the steps on one side have a 'tread' of one foot nine inches, on the other of one foot five inches, both rising eleven and three-quarter inches on the face, making in one case an angle of twenty-nine and a half degrees, and in the other thirty-five degrees. These are not usual angles for a pyramid, and on some contemporary and older coins and medals there are representations of tombs with steep pyramidal roofs such as Cockerell adopted in his restoration. But the slope given by the steps in the Museum is the usual slope of the roofs of Greek buildings; and the remains of the architecture as well as of the sculpture prove that the building was Greek in design. The architects, whose names show that they were Greeks, while compelled to accept the traditional form of a pyramid for the tomb, may have lowered its pitch in conformity with their ideas of the proper slope for the roof of a Greek building.

One thing is certain, that of any attempted restoration of the Mausoleum this flat-sloping roof must form a part.

But the pyramid rising at these slopes from the four sides from a base of about sixty-three feet by fifty-three feet meets in a point at about the eighteenth step, not only giving no platform for the quadriga, but no place in the pyramid for the remaining six steps. It is this which has prompted the restorers, since these steps were found, to make the building larger than Pliny says it was.

But Pliny does not say that the steps of the pyramid 'in metæ cacumen se contrahens,' were all of the same form and dimensions; the words rather imply the con-

trary, and there are among the remains in the Museum several higher steps with narrow treads, including one of twenty-four inches rise, and four inches tread.

May not these, or similar steps now lost, be the steps of the 'meta' he speaks of? The restorers all hitherto ignore his assertion that the pyramid contracted itself, ending in a 'meta.' We know what a meta or goal in the chariot races was like; a high steep cone, like a pine-cone in form; in a Roman circus sometimes like an obelisk, square-sided—which may have been what Pliny was thinking of; and why should he have mentioned a 'meta' if there was nothing like it in the building? The passage is a marvel of conciseness. He does not waste his words. If he had meant what the restorers think, he could and would have conveyed his meaning better, by saying 'the pyramid rises to a point,' as it is the nature of a pyramid to do, without needlessly bringing in the form of a meta; and it did not end in a point when Pliny described it, but in a platform or base for the quadriga.¹

Newton, Fergusson, and Oldfield have not attempted to use in their restorations any steps except the broad low ones; but positions must be found for all existing forms in any design which shows what the Mausoleum was.

¹ 'Cacumen' is used by Pliny and other writers for the top or end of things. In his *Natural History* (Book xi., section 220) Pliny uses the word for the ends of the limbs of the body, 'Arteriarum pulsus in cacumine maxime membrorum evidens.' Again, in his *Natural History* (Book x., Section 151), he uses it for the end of an egg, 'Si contra lumen cacumine ovorum apprehenso una manu purus perluceat color sterilia estimantur.' Quintus Curtius, who wrote in the first century A.D. a history of Alexandria, describes a rock (viii. xxxix., 6), 'Petra in metae modum erecta est cujus ima spatiosiora sunt altiora in artibus coeunt summa in acutum cacumen exsurgunt.' This proves that 'cacumen' is not always a sharp point. A common use is for the tops of trees. Columella, a writer on agriculture about A.D. 50, uses the word for the tops of fig trees, pear trees, and apple trees. These quotations, for which I am indebted to the late Mr. Neil, of Pembroke College, Cambridge, go to show that Pliny's words, 'Pyramis in metae cacumen se contrahens,' may mean a pyramid contracting itself into and ending in a meta.

Many of the steps must be lost, and there may have been more varieties than those of which there are examples in the Museum—our not having any does not prove that there were none such in the building. Being light and at the highest part of the building, they would be scattered by an earthquake. Easy to handle or to carry on an ass's back, they would be the first to be taken for building or making lime, and while we must use all existing forms we are entitled to assume that there were as many of each kind as may be wanted in the restoration of the building which Pliny describes.

Pliny's words suggest that the pyramid of low broad steps contracted itself by a curve which can be formed by steps of intermediate size leading up from the broad steps of the pyramid to the tall ones of the meta supporting the quadriga which crowned the monument.

This is corroborated by the existence in the Museum of two steps, one with a tread of ten inches and the other of four inches, both eleven and three-quarter inches high, the same height as the flatter pyramid steps. If we place them between the highest of the broad steps of the pyramid and the tall steps of the meta, it lessens the harshness of the junction between them and increases the size of the meta, making the platform large enough to accommodate the chariot group.

That a roof of this form realises all the descriptions and dimensions, finds uses for all the materials in a way and in positions suitable for them, fits in with all the other parts of the building, and gives good and stable construction—is a strong presumption (amounting even to proof) that it was the form of the roof of the Mausoleum.

It may seem strange and unsuitable in a Greek building, but Carian tradition may have prescribed a pyramid as an essential feature of a tomb, and the Greek architects

may have had to make the best they could of it. It suits its purpose and is right in its place. The low pyramid has the same pitch as the pediment of Greek temples, and the meta rising from it forms a suitable base for the quadriga, lifting it aloft to the stars.

A platform was needed on the top of the meta of the size and form required for the quadriga. We know the angles (or slopes) of the fronts and sides of the pyramid from the four corner steps in the Museum, which have broader treads on one side than on the other. Now, if the lines forming the four corner slopes of the pyramid are continued along the corner slopes of the meta, they terminate, at the height of forty-four feet from the cornice, in a square platform of eighteen feet six inches on each side. THE QUADRIGA

This fits the remains of the quadriga in the Museum. The fore-quarters of one, and the hind-quarters of another of the horses show that they were about ten feet or ten feet six long from head to tail. For the chariot and the space between it and the horses about eight feet would be required, making the length of the platform about eighteen feet six inches. The width of the haunches of the horse in the Museum is three feet six inches. Allowing spaces between the horses and at the edges, and also for the pole, the width of the platform must be nearly, if not exactly, eighteen feet six inches.

It would therefore seem that the broader and narrower steps were designed to produce, from the base of the pyramid, which is longer on the sides than the fronts, a square platform of the size required for the quadriga.

We have now to determine the height of the roof, consisting of a low pyramid with a meta rising from it. I think Pliny gives us this. It is probable that he would, since he gives the other heights. 'Above the pteron,' he HEIGHT OF
PYRAMID, ETC.

says, 'a pyramid contracting itself in twenty-four steps "in metæ cacumen" equalled or equals' (I don't think it matters which reading we adopt) 'the lower height' or 'lower part in height.'

The simple and apparently obvious meaning is that the pyramid above the pteron, which he had just said was twenty-five cubits high, equalled in height the part below the pteron: that the roof and the base of the sepulchre were equal in height. Dr. A. S. Murray doubted if the words can bear this meaning, but other scholars whom I consulted, the late Mr. Neil and Professor Stewart, of Christ Church, Oxford, assured me that it can.

Let us try what results this gives as to the heights of the base and roof of the monument. 'On the summit,' he says, 'is a marble quadriga, the addition of this made the height of the entire work one hundred and forty feet.' If we subtract from one hundred and forty feet the height of the pteron and of the quadriga, the remainder, divided by two, will give the heights respectively of pyramid and of base. The pteron is twenty-five cubits or thirty-seven and a half feet high, which is within an inch or two the height of the order as set up in the Museum. We can get approximately the height of the quadriga.

The statue of Mausolus, which stood in the chariot, is ten feet two inches high; the bottom of the chariot was, say, eight inches thick, and it rests on the axle, say ten inches thick; the wheel measures seven feet six inches in diameter. This makes the height from the lower edge of the wheel fifteen feet, viz. :—

			Ft.	Ins.
Statue,	.	.	10	2
Bottom of chariot,	.	.	0	8
Top half of axle,	.	.	0	5
Half of wheel,	.	.	3	9
			<hr/>	
			15	0

The platform, formed of great stones, supporting the quadriga, was, say, 2 ft. 6 in., making the total height of the quadriga 17 ft. 6 in. Subtracting this and the height of the order (= 37 ft. 6 in.) from Pliny's total of 140 ft., the remainder is 85 ft., which, equally divided between roof and base, gives 42 ft. 6 in. for the height of each.

There is a singular confirmation of this hypothesis. The statement of Hyginus that the Mausoleum was eighty feet high has hitherto been unmeaning. Newton and Pullan dismiss it from consideration as incompatible with Pliny's dimensions. Mr. Fergusson suggests that for feet we should read cubits—Babylonian cubits—as Mausolus was a satrap of the Babylonian monarch, and eighty Babylonian cubits are equal to one hundred and forty feet of Pliny.

This is certainly ingenious—perhaps too ingenious; for that Hyginus, writing in Latin for Romans, should for this one dimension use Babylonian cubits, which it is unlikely his readers knew anything about, while his other dimensions in the same passage are in feet, which they understood, is improbable; and Mr. Oldfield properly rejects the emendation as having no authority from the manuscripts.

But no emendation is necessary—Hyginus is quite right. The Mausoleum was 80 ft. high, if I am right in my reading of Pliny's words; and it agrees with Pliny's dimension of 140 feet for the whole building, including the quadriga with the statue. Pliny's height of 37 ft. 6 in. for the pteron, added to the 42 ft. 6 in. which we found for the base below it, gives exactly 80 ft. to the top of the cornice, which is the ordinary way of expressing the height of a building.

We have now to consider the base of the monument THE BASE
below the pteron. What was the form of the part of the

monument which Pliny says was four hundred and eleven feet in perimeter? It was not the part he says was called the pteron, sixty-three feet on the sides, shorter on the fronts, of which the perimeter is about two hundred and thirty feet.

The story of the final destruction of the Mausoleum by the Knights of Rhodes tells us what it was.

‘When these knights had arrived at Mesy they at once commenced fortifying the castle, and, looking about for stones wherewith to make lime, found none more suitable or more easily got than certain steps of white marble raised in the form of a *perron* in the middle of a field near the port, which had formerly been the great *Place* of Halicarnassus.’

‘A *perron*,’ Viollet-le-Duc says in his *Dictionary of French Mediæval Architecture*, ‘was a flight of steps leading to a platform from which the Seigneur delivered judgments, or to the great hall of a château or palace.’ From such a platform at Frankfort the newly elected Emperor was proclaimed.

The statement of the knights, familiar with castles and palaces, is good evidence that there remained at the Mausoleum when they saw it such a platform or base, with steps leading up to it, to which Pliny’s circumference of four hundred and eleven feet must apply. Its being built of marble shows that it was an essential part of the monument, a part of the height of forty-two and a half feet below the pteron which, he says, equalled the height of the pyramid and meta above it. It was above ground, visible from a distance. Its height can only be conjectured; the steps to it show that it was accessible; not so high but that the approach thus formed was easy and dignified. A height of seventeen feet seems to give good proportion: the wide base it forms gives a sense of stability to the superstructure, and the remainder of the forty-two and a

half feet gives a solid base or podium to support the pteron, the open stage of columns and, with the roof crowned by the quadriga rising from it, the appearance of airy openness and height which Martial describes as characteristic of Carian mausolea.

The pteron must have been accessible, as it could be by the door in the podium and the stairs between the walls supporting the two ranges of columns, rather than through the great hall in the basement, the entrance to which Newton found permanently closed, apparently after the funeral of Mausolus.

The Mausoleum, Hyginus states, stood within a peribolus, an enclosure surrounded by walls with the circuit of one thousand three hundred and forty feet. The north wall of it was the first part of the Mausoleum Sir Charles Newton discovered when he was about to abandon the search for it as hopeless, the captain of the warship which was to bring home the remains which might be found having refused to wait longer. THE PERIBOLUS

It is built against the rise of the hill to the north, of marble blocks finished on the outer face, left rough against the hill at the back. Behind it he found the remains of the quadriga where an earthquake would throw them from the top of the building, where they had remained buried since they fell, else the bronze bit would not have remained in the horse's mouth.

The length of the wall to its ends where it turned south at right angles was 337 ft. or 674 ft. for the north and south walls, leaving 666 ft. or 333 ft. each for the end walls. What gate or entrance it may have had in it is uncertain, or what its height may have been. He found it unfinished; the stones of the upper part may have been carried away for building, and the lion which he found

standing on it was more likely placed there from some other part of the building than thrown there by the earthquake, as it seems unlikely that it would fall on its feet.

THE CONSTRUCTION

Any restoration of the Mausoleum must take into account the fine large square apartment ornamented all round with marble columns and architrave, with frieze in half-relief, with the coloured marbles and reliefs of battle scenes on the walls, into which the knights descended, and leading out of it the chambers in one of which was the white marble sarcophagus. They destroyed what was above ground, and found that the deeper they went the more the structure was enlarged.

This large hall makes impossible the square tower in the centre of the pteron which Cockerell in his restoration suggests to support the quadriga. Further, in the wide basement, four hundred and eleven feet in circumference, there is ample space not only for this hall, but for the sepulchre with its marble sarcophagus opening out of it, and for additional chambers which such tombs often had.

The plan and section show how the pyramid, the meta, and the quadriga could be supported by the walls of the hall and the columns of the pteron. The weight of the flat pyramid part of the roof is supported by the thirty-six columns. It has little or no outward thrust in itself, and its solid mass resists the outward thrust of the sloping sides of the meta, which is greatest at the angles.

Its steps and the stones of the cornice and architrave under them are cramped together by bronze cramps, the holes for which remain, so as to form a ring resisting the outward pressure of the sloping roof increased by the weight of the quadriga.

As shown on the section, the sides of the meta come

down on and supported by the inner range of columns, leaving an opening about sixteen feet square at the top, too wide to get stones long enough to cover, and strong enough to support the weight of the quadriga. The size of the opening can be lessened by a lintel resting on the two columns next each inner angle column, and upon it building a wall to the top of the meta sloping inward with its slope, making its shape inside octagonal, and leaving a triangular open space between this wall and the square angles of the meta. This wall strengthens the sides of the meta along their centres, and lessens the opening at the top to an octagon of eleven feet across.

The weight to be supported and the adequacy of the columns for supporting it are approximately as follows:—

Weight of quadriga,	.	.	say 100 tons
„ „ walls of meta,	.	.	„ 300 „
„ „ pyramid,	.	.	„ 400 „
Total,			<u>800 tons.</u>

This weight is borne chiefly by the eight columns at each corner of the octagon.

Each column, three feet five inches in diameter, equal to nine square feet, can support a weight of one hundred and eighty tons, or twenty tons per square foot, which is not very different from present practice.¹

For the marble of the columns, from its solidity and uniformity of structure, and from the separate drums being rubbed together on each other at the joints, as was the practice in building the marble columns of Greek temples, so that no splitting from inequalities of bearing would occur, is free from the chance of defects to which iron and

¹ The structural questions involved were arrived at after discussion with Mr. Max am Ende.

stone are liable. This allows a much smaller margin of safety than in columns of iron or ordinary stone.

Greater strength would not have saved the monument from destruction by earthquake, and would have marred the characteristic feature of the design — ‘hanging in empty air.’ The resistance to lateral pressure would be least at the pteron, and here, if rocked by an earthquake, it would break across, throwing the quadriga to where it was found.

How the walls of the meta were constructed is a matter of conjecture. Of steps with a rise of twenty-four inches, and a tread of four and a half, which I have taken as the dimensions of the steps of the meta, only one, some fifteen inches thick, is shown in the Mausoleum Room, and a brief search among the marbles in the cellar with Dr. Murray revealed no more. Such a wall may not seem strong enough to support the weight of the chariot and colossal horses, but the example preserved may quite well be a casing stone.

OTHER MAUSOLEA

Pliny's words imply that there were other mausolea in Caria besides that at Halicarnassus. One such remains at Mylassa, the former capital of Caria, which Mr. Oldfield, with every probability, thinks is a reproduction in Roman times, with debased details, of the distinctive and characteristic features which had obtained for the Mausoleum its extraordinary renown. In it we find, he says, ‘(1) a square podium with a door on one of its sides not placed in the centre. (2) Then a pteron formed of an entirely open quadrangular space, surrounded by a cincture of columns. (3) Above these the remains of a pyramid of peculiar and ingenious construction.’ In its ruinous state we cannot tell what exact form its pyramidal roof may have had: it may have had a meta springing from its top.

The roof, or what remains of it, is octagonal in plan, which would give support for a meta rising from it. But this octagonal form, which it now shows in its ruined state, may be merely the angle braces such as I suppose in the Mausoleum meta, concealed when the building was perfect by a roof square in plan, like the building which it covered.

The restoration of the Mausoleum I have suggested is more like this tomb at Mylassa than any other restoration I have seen, especially in the entirely open quadrangular space surrounded by a cincture of columns.

The great merit of the building, which, Pliny says, THE SCULPTURES chiefly caused it to be counted one of the seven wonders of the world, was the sculpture. Except portions of three friezes and the fifteen lions, little of it remains. A few broken torsos of statues, about life size, are the only remains of doubtless many more. As the Mausoleum was for centuries a quarry, the statues were doubtless made into lime for building, as Dr. Middleton found that those at the House of the Vestal Virgins at Rome had been. They were useless as building stones, and their small size and the ease with which they could be broken up made them suitable for making into lime.

The remains of the quadriga were saved by being buried, and the lions, and possibly some of the friezes which we have intact, may have been preserved by the mediæval builders through appealing to their fighting instincts.

The positions on the Mausoleum of some of the sculptures which remain can be certainly determined. The quadriga, Pliny says, crowned the monument, supported by the meta: the Amazon frieze is the frieze of the order of the pteron. But the positions of the re-

mainder can only be conjectured. The frieze of the chariot races, of softer marble, with the colour remaining, proving that it had not been exposed to the weather, may have been that of the order inside the pteron.

The corners of the *perron*, or broad lower base, as Cockerell has suggested, are suitable positions for the colossal statues of horse and rider in violent action, of which one remains, and the life-sized statues seem well placed on its parapet between them, and also on the cornice over each column of the pteron, carrying the eye up to the quadriga—the crowning feature of the monument.

The gigantic sitting torso, with the same dress as the statue of Mausolus, may have represented him sitting on his throne, perhaps within the pteron.

The lions, of which fifteen remain, have their heads turned to the side, as if guarding the approach to the tomb. They seem suitably placed on the flanks of the steps leading up to the *perron*. This does not account for the fifteen that now exist, but others may have guarded the approach to it, like the sphinxes at Egyptian temples, and it must be remembered that probably many are lost.

That this restoration of the Mausoleum at Halicarnassus realises all the contemporary measurements and descriptions of Pliny, Hyginus, Martial, and the Knights of Rhodes, finds their right positions for the architectural remains in the British Museum, and that it is stable in construction seems proof that, in its general appearance, it represents what the building was like.

Some of its features may be taken as proved: the total height (including the quadriga) of one hundred and forty feet, the height of the pteron thirty-seven and a half feet, the number of the columns and their arrangement on the building, carrying the weight of the pyramid

and quadriga without any central support (which would have destroyed the open appearance—its main characteristic), and that the statement of Hyginus, hitherto unmeaning, that it was eighty feet high, was correct.

The size of the pteron, sixty-three feet on north and south, shorter on the fronts, and the position and spacing of the columns, accord with the remains of it as erected in the Museum and with Pliny's dimensions; as do the combined heights of the pyramid and meta above it, and of the podium and the broad base with the perimeter of four hundred and eleven feet under it, giving room for the great central hall and the tombs and chambers round it, which the Knights of Rhodes saw and destroyed. That this lower base was accessible seems proved by the *perron* with its steps, which they saw and made into lime.

There is evidence of the peribolus wall and of the lengths of its sides, but its height is uncertain. Newton found only its lower corners. I have not attempted any suggestion as to the gate or entrance it may have had; for this we have no evidence.

The feature of the building which was its chief characteristic and called forth universal admiration is also certain; its open and airy appearance, 'hanging in empty air,' with the blue sky seen between the columns from every different point of view. This a drawing from one point cannot show.

Parts of the design are necessarily conjecture—the relative heights of the podium and broad base, the statues on the latter and on the cornice of the pteron, and the door in the podium giving access to the open stage, and the lions on each side of the flight of steps.

To make a restoration of what the Mausoleum may have been it was necessary to decide such doubtful points

as these, and to design additions not strictly warranted by Pliny's short but admirable account, and by those of other writers, and by the existing remains. Positions especially must be found for the sculpture, which must have been abundant, but of which, except the friezes, almost nothing remains. In thus attempting to complete the design of the Mausoleum one can only be guided by the sense of what is beautiful and in harmony with the main features of the building which we have found to be proved.

The building which results may not in its architecture be such as we might think Greek architects would design. A pyramid does not seem the form of roof they would by choice adopt, but, as has been said, it may have been prescribed by custom or tradition for Carian tombs.

Pliny says it was mainly on account of its sculpture that the Mausoleum was regarded as one of the seven wonders of the world. It is an advance on previous styles, and, though we now may see this was the beginning of decadence in the art, would appeal to those who first saw it as new advance.

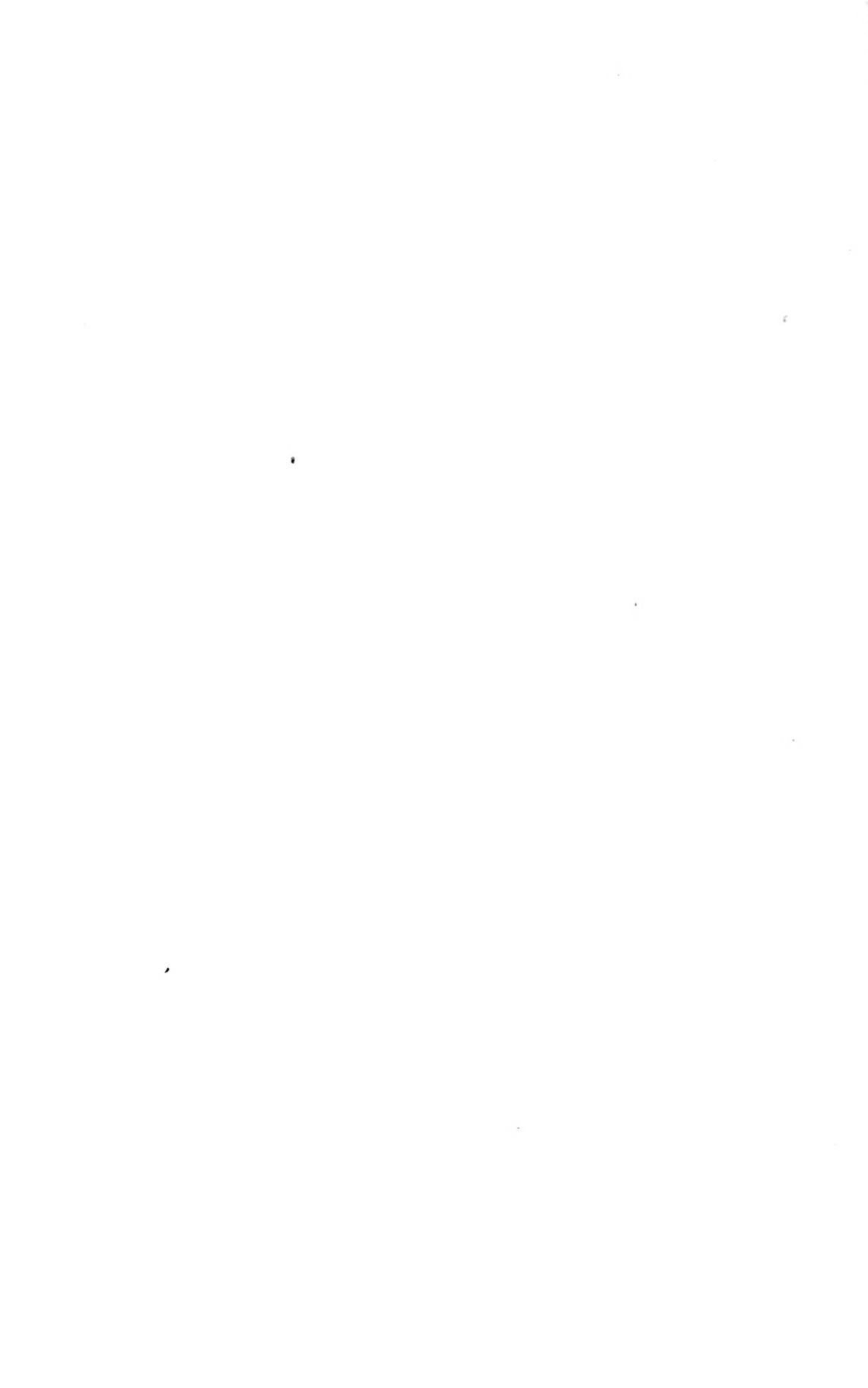
We do not know what its immediate surroundings were, but the view from its site remains the same looking out across the bay to the hills on the right and the palace of Mausolus on the promontory on the left.

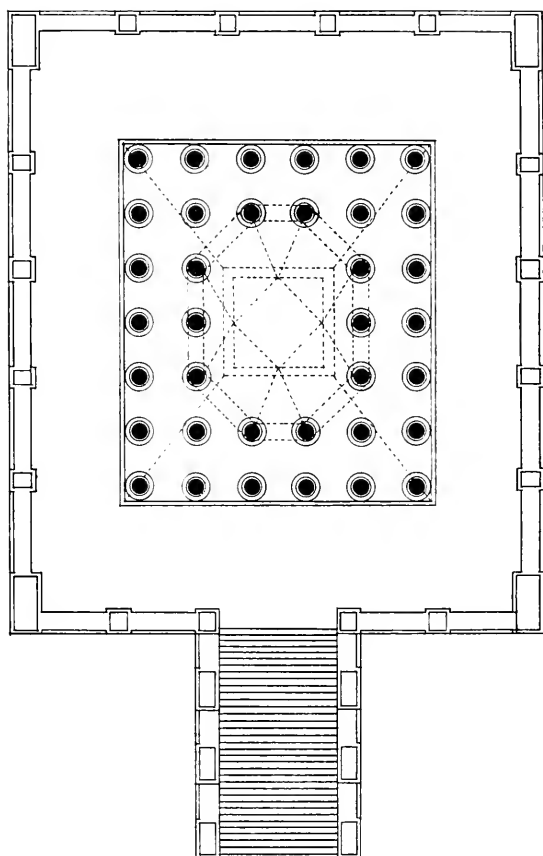
The sculpture is the ruling motive in the design of the building and tells its purpose—the Apotheosis of Mausolus; all the parts of it, the broad base, the pteron, the pyramid, and the meta lead the eye up to its crowning feature, the quadriga—as do the statues on the corners of the pteron, continuing upward the lines of its columns. In the clear air of Caria these and the frieze of the order, the lines of figures defined against the blue background, would be

clearly visible in every detail, though at a height of eighty feet.

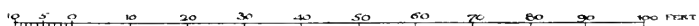
The meta forms an admirable base for the colossal horses and chariot it supports, 'raising them aloft to Heaven;' Mausolus standing with Artemisia at his side, starting on his journey through the skies.

THE END

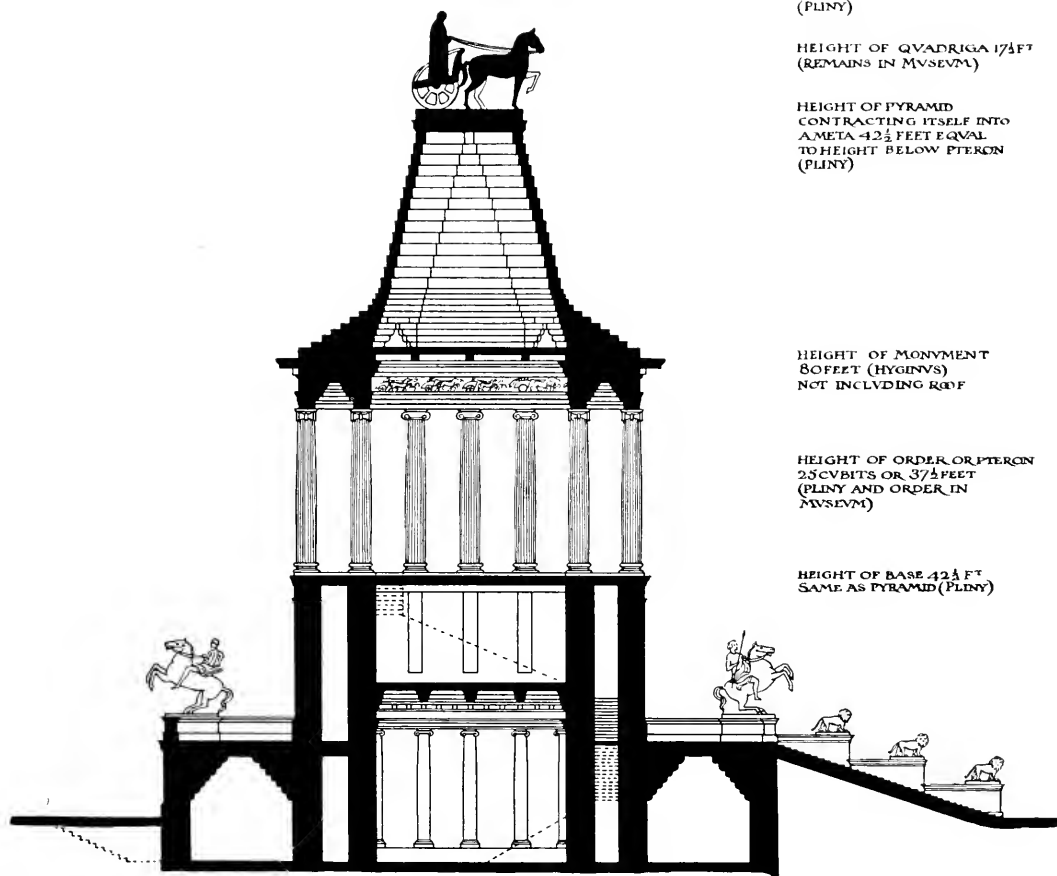




PLAN







TOTAL HEIGHT 140 FEET
(PLINY)

HEIGHT OF QVADRIGA $17\frac{1}{2}$ FT
(REMAINS IN MUSEVM)

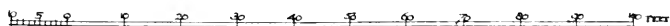
HEIGHT OF PYRAMID
CONTRACTING ITSELF INTO
A META $42\frac{1}{2}$ FEET EQUAL
TO HEIGHT BELOW PTERON
(PLINY)

HEIGHT OF MONVMENT
80 FEET (HYGINVS)
NCT INCLUDING ROOF

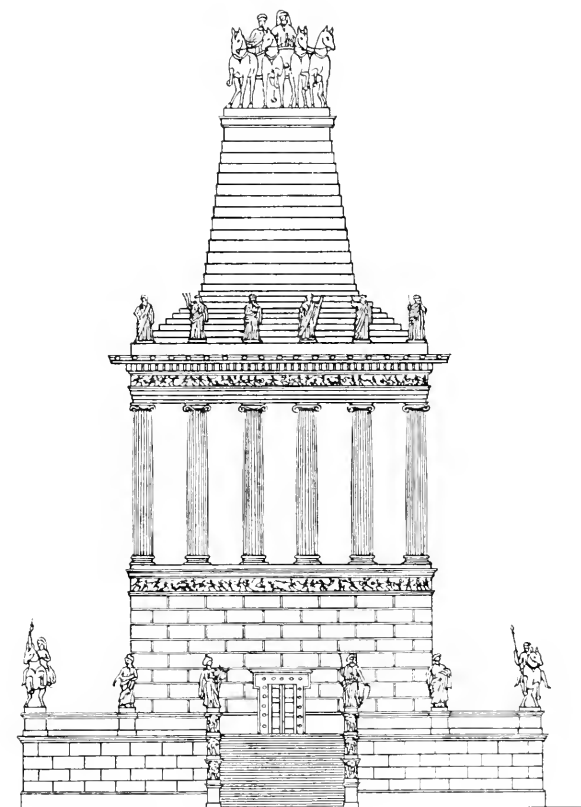
HEIGHT OF ORDER OR PTERON
25 CVBITS OR $37\frac{1}{2}$ FEET
(PLINY AND ORDER IN
MUSEVM)

HEIGHT OF BASE $42\frac{1}{2}$ FT
SAME AS PYRAMID (PLINY)

SECTION







ELEVATION





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